BEFORE THE STATE OF WASHINGTON
ENERGY FACILITY SITE EVALUATION COUNCIL

IN RE APPLICATION NO. 96-1	)
	)
OLYMPIC PIPE LINE COMPANY:	)
CROSS CASCADE PIPELINE PROJECT	)
	)
	)

EXHIBIT _____ (LCB-T)

REBUTTAL TESTIMONY OF LARRY C. BENNINGTON

ISSUES: LEAK PREVENTION AND DETECTION

SPONSOR: OLYMPIC PIPE LINE COMPANY

Q. State your name.

A. Larry C. Bennington

Q. Please summarize the issues you will address in your testimony.

A. In general, my testimony will respond to testimony provided by other witnesses concerning the proposed design and operation of the Cross Cascade Pipeline with respect to spill prevention and detection. In particular, I have focused on the testimony of James W. Miller (CFE), Elin Storey (WDOE), Kenneth Johnson (King County), Randy Sandlin (King County), William Roberds (Cross Valley Water District), Lois Epstein (CCA), Charles Batten (CCA) and John Mastandrea (CCA). In responding to this testimony, I will address four general topic areas: First, my background and experience. Second, the proposed design and operation of the pipeline. Third, the design or operational changes proposed by various witnesses as additional mitigation measures. Fourth, the likelihood of spills from the proposed pipeline.

Background & Experience

Q. Please describe your education background.

A. I have a Bachelor of Science Degree (B.S.) in Civil Engineering and a Master's Degree in Business Administration (M.B.A.). I am also a registered professional engineer, and have taken numerous continuing education courses over the years.

Q. Please describe your prior employment experience.

A. I have worked in the oil industry for over thirty-five years and the pipeline industry for over thirty years. Following graduation, I worked in Amoco's Whiting Refinery and in 1964, I started working for Service Pipeline Company, which later became a subsidiary of Amoco Corporation, as a staff engineer evaluating the hydraulics, feasibility and economics of various pipeline projects. Over the years, I progressed through the Amoco organization to chief engineer for the Central Division in 1970, Manager of Operations in 1974, Manager of Transportation Planning

in 1983, Division Manager in 1985, and Vice President and General Manager of Engineering for the entire pipeline company in 1988. A more detailed resume is provided as Exhibit LCB-1. During my tenure at Amoco, I was involved in virtually every aspect of the pipeline business, from design and hydraulics, to construction and maintenance in the field, to product movement and remote operation, to leak detection and spill response. I have worked on literally hundreds of pipeline projects, at least twenty of which were as large as the proposed Cross Cascade Project.

Q. What is your current occupation?

A. I am a pipeline consultant and the President of Milepost Consulting Services, Inc., based in Mansfield, Texas.

Q. Do you participate in any professional organizations?

A. Yes. I am a member of the American Petroleum Institute (API) and serve on its Pipeline Operations and Technical Committee. The committee reviews the adequacy of existing standards and recommended practices and develops new standards to ensure safe operation of pipelines. I also currently serve as a Work Group chair on the American Society of Mechanical Engineers (ASME) B31.4 Code Committee for Liquid Transportation Systems for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia and Alcohols. I am also working with the American National Standards Institute (ANSI) and API in connection with a project to develop a worldwide pipeline code through the ISO organization.

Q. What does your work with Milepost Consulting entail?

A. I provide consulting services to government agencies and private industry in connection with a wide variety of pipeline-related matters. For example, I have studied pipeline maintenance practices, reviewed pipeline operations, provided advice on pipeline design and construction, and served as a expert witness in litigation concerning pipeline design, construction and operation.

Q. Please explain the basis of your knowledge concerning the Cross Cascade Pipeline Project of Olympic Pipe Line Company.

A. I have reviewed Olympic's Application for Site Certification (May 1, 1998) and portions of the Draft Environmental Impact Statement Prepared by EFSEC's consultants. I have also met with members of the Olympic Project Team (Claude Harshbarger, William Mulkey, Gordon Eastling, Keith Edwards and John Terriet) as well as other Olympic personnel (Frank Hopf and Ron Brentson) to discuss aspects of the project and Olympic's operations.

Pipeline Design and Operation

Q. Several witnesses have criticized the Cross Cascade Pipeline project design. What is your overall assessment of the project?

A. It is my opinion that Olympic's proposed design and operation will effectively and reliably transport refined petroleum products to Central and Eastern Washington, while at the same time protecting the public against safety and environmental risks that are potentially associated with transporting refined petroleum products by pipeline. The pipeline will be designed, constructed and operated in accordance with all applicable Federal and State regulations as well as the latest American Petroleum Institute (API) standards and recommended practices. Indeed, as discussed below, in most major areas, the pipeline will exceed regulatory and industry standards.

The pipeline has been designed to minimize the possibility of any leaks, spills or releases. Among other things:

- The pipeline is being designed by highly experienced and reputable pipeline engineering firm, MARMAC Engineering.
- The pipeline will be constructed with high strength, carbon steel pipe. The pipe will be manufactured according to specifications developed by MARMAC and Olympic that exceed the requirements of the industry standard, API 5L. The pipe will be 5LX-52, with a Specified Minimum Yield Strength of at least 52,000 psi. Quality control inspectors at the steel mill will ensure that these specifications are met.

- The standard wall thickness will be a minimum of 0.281 inches for the 14-inch segment of the pipeline and a minimum of 0.250 inches for the 12-inch segment of the pipeline. At road, rail and bridge crossings, thicker walled pipe will be used. For river crossings, pipe with a wall thickness of at least one-half (0.500) inch will be used. For stream crossings, Olympic plans to use .312 inch thick pipe. Olympic will also use heavier wall pipe in and around pump stations to accommodate operational pressures.
- The pipeline will be coated with 40 mils of polyethylene. This is a superior coating used by the industry to resist corrosion and mechanical damage during construction. All field joints will also be coated with a compatible heat-shrinkable polyethylene wrapping. For horizontal directional drilled (HDD) stream crossings, Olympic plans to use pipe coated with 16 mils of fusion-bonded epoxy overlaid with 60 mils of powercrete or CR urethane, and for trenched stream crossings, Olympic plans to use pipe coated with at least 40 mils of high density polyethylene and one inch of standard concrete coating.
- The pipeline will be further protected from corrosion by an impressed current cathodic protection system. Olympic has already conducted a site-specific cathodic protection survey to ensure that the cathodic protection system will provide sufficient corrosion protection in the pipeline's specific environment. A tentative design of the cathodic system envisions placing five rectifiers and ground beds along the route. Additional rectifiers will be used if necessary following construction. Test stations to facilitate the monitoring of the system will be installed at approximately one-mile intervals in rural areas along the pipeline, and more frequently in urban areas.

- Pressure control instrumentation and pressure relief valves will be utilized to assure that the pipeline operating pressure remains within its specified limits.
- All mainline valves will be designed to operate remotely and to provide positive shut off. Block valves located between pump stations and delivery facilities will be weld-end valves, which are not susceptible to leaks as are flanged valves. Olympic intends to place all valves above-ground, surrounded by impervious soil and berms or dikes. If it becomes necessary to locate any of the valves below ground, however, Olympic will place them within liquid-tight vaults.

The pipeline will be constructed to minimize the possibility of any leaks, spills or releases. Among other things:

- The pipeline will be constructed by pre-selected and qualified construction firms and personnel. Construction will be governed by a comprehensive set of specifications and monitored by an experienced construction management team to ensure compliance with those specifications. Independent agency inspectors will also monitor and oversee construction.
- Olympic plans to construct the pipeline at a minimum depth of 4 feet. For stream crossings, Olympic plans to place the pipe at least two feet below projected scour depth. For horizontal directional drilled (HDD) crossings, the pipe will be at least 20 feet below river or stream bottom.
- The pipeline will be constructed using Shielded Metal Arc Welding, in compliance with API standards. Welding will use a proven welding procedure consistent with the pipe, and be governed by a welding specification. All welding will be performed by qualified welders who have been tested on the welding procedure, and all welds will be inspected by qualified inspectors. All welds will

be inspected radiographically, with radiographs examined by both an OPL welding inspector and an independent ASTM Level II Radiographer.

- Following construction, Olympic intends to conduct an 8-hour hydrostatic test of the entire pipeline at 125 percent of maximum operating pressure (MAOP). The pipe segments used on all major stream and river crossings will also be tested hydrostatically before installation, so they will in effect be tested twice.
- Olympic will conduct an internal line inspection with both a high resolution magnetic flux leakage (MFL) tool and a geometry inspection (caliper) tool following initial startup. These so-called "smart pigs" can detect anomalies in or damage to the pipeline, and the initial inspection will provide a baseline for use in evaluating the pipeline's condition with subsequent inspections.

The pipeline will be operated and maintained so as to minimize the possibility of leaks, spills or releases. For example:

- Operations and maintenance of the pipeline will follow a comprehensive set of procedures developed by Olympic. Operations and maintenance will be performed by trained, experienced pipeline personnel, supplemented by qualified support resources as necessary.
- Olympic will monitor the physical condition of the right of way, watching for suspected leaks, potential pipeline damage, and any encroaching activities that might damage the pipeline. Olympic will conduct aerial surveillance on a weekly basis, weather permitting, and ground surveillance, where necessary and appropriate. Olympic will also conduct aerial surveillance of stream crossings after every five year storm event, and ground surveillance at each high risk stream crossing after a five year flood event.

- Olympic will conduct regularly-scheduled internal line inspections of the pipeline using high resolution magnetic flux leakage (MFL) and geometry inspection tools. Olympic will conduct internal inspections at least once every five years.
- Olympic will routinely monitor the effectiveness of the cathodic protection system with annual pipe-to-soil surveys, and monthly rectifier monitoring.
- Olympic will provide internal corrosion control by monitoring and analyzing corrosion coupons.
- Olympic will investigate potential problems identified during internal inspections, corrosion control monitoring and cathodic protection, and take appropriate remedial actions.
- Olympic will conduct stream crossing scour surveys at one, three and five year intervals.
- Olympic will utilize its well developed public awareness system to contact and inform third-parties of the pipeline's presence. Olympic will install and maintain route markings and participate in the one-call system used in the State of Washington, enabling third-parties to determine the location of the pipeline before beginning activities that might damage the pipeline. Olympic will observe construction and excavation activities conducted near the pipeline to ensure that the pipeline is not damaged by those activities.

Finally, the pipeline has been designed and will be operated to promptly <u>detect</u> any leaks, spills or releases that might occur. For example:

- Olympic will operate the pipeline with a sophisticated Supervisory Control and Data Acquisition (SCADA) system. The SCADA system scans thousands of data points every 5 to 6 seconds. By monitoring this data, Control Center operators can detect irregularities in pressures, flow or other measurements indicating that a

spill or leak may have occurred. The system maintains a constant comparison of inflow and outflow using extremely precise, routinely proven, turbine meters, and uses trending to facilitate evaluation of operational events that may lead to potentially abnormal conditions

- Along with the SCADA system, Olympic will utilize a computerized Pipeline Leak Detection System (PLDS) developed by Modisette & Associates. The PLDS uses inputs from the SCADA system to compare actual temperature, pressure and flow measurements on the pipeline to expected values generated by a mathematical model of the pipeline system. When actual and modeled values differ beyond set parameters, system alarms occur, and potential leaks can be investigated. In order to enhance the capability of the PLDS, Olympic will install temperature and pressure measurement equipment at each mainline valve location along the pipeline. As a matter of fact, the PLDS that Olympic intends to use follows the methodologies recognized by API 1130 (Computational Pipeline Monitoring or CPM) and contains the features and functionality of the most sophisticated CPM method. Moreover, the process used by Olympic in the leak detection arena follows the rationale contained in the Volpe National Transportation Center report to the U.S. Department of Transportation on "Remote Control Spill Technology."
- Olympic will inspect the pipeline and its facilities visually for signs of inadvertent releases. Olympic will conduct over-flights of the pipeline route weekly, weather permitting. Olympic personnel will routinely inspect segments of the pipeline in the normal course of maintenance work along the line, and Olympic personnel will visit and inspect stations daily and valve sites weekly.

- Olympic will conduct monthly static tests of the entire pipeline. On a quarterly basis, Olympic will also conduct static tests on individual pipe segments by isolating those segments between block valves.
- Olympic will conduct community outreach programs designed to encourage third-parties to notify Olympic of any unusual conditions that may indicate that a spill or leak has occurred or the potential for such an incident. Markers along the right of way will also provide a toll-free number that third parties may use to report problems 24 hours a day. Olympic will respond immediately to such notifications.

Q. Are you familiar with the federal regulatory requirements applicable to refined petroleum product pipelines?

A. Yes. The federal regulations concerning design, construction, operation and maintenance of product pipelines, are found in 49 CFR 195. I am familiar with these regulations as a result of my more than 30 years working in the pipeline industry as well as my involvement with API and ASME.

Q. In addition to the federal regulations, are you familiar with standard practices within the pipeline industry applicable to refined petroleum product pipelines?

A. Yes. Industry standards, recommended practices and specifications are developed and formalized by various industry organizations, including API, ASME and the National Association of Corrosion Engineers (NACE). In some instances, these industry standards are incorporated into the federal regulations by reference. Again, having worked in the industry for over 30 years and having been active in both API and ASME, I am familiar with these industry standards.

Q. In her testimony, Lois Epstein (CCA) criticized the federal pipeline regulations as vague and inadequate. Do you agree with her criticisms?

A. No. The federal regulations contain requirements designed to ensure the safe operation of pipelines and to protect the environment. Some of the regulatory requirements are necessarily written in general terms in light of the many different types of pipelines and circumstances to which they will be applied. The industry, however, has always viewed those regulations as establishing minimum requirements. Industry codes, standards and recommended practices elaborate upon and go beyond those federal regulatory requirements to address specific situations and advancing technology. The industry codes, standards and recommended practices are well recognized and followed by the industry.

Q. Ms. Epstein also testified that "the industry as a whole is lagging" with respect to leak and spill prevention. Do you agree with that statement?

A. No, I do not. Pipeline operators have a strong incentive to prevent spills and leaks. Operators make their income by successfully transporting refined petroleum products. They generate no income by spilling product, and they incur substantial costs in connection with spill response, environmental remediation, pipeline repair, lost product, and even potential litigation associated with spills. Over the years, the industry as a whole has been active in improving pipeline technology and continuing to explore technological advances in spill prevention, detection and response. In my experience, individual pipeline companies are constantly researching and experimenting with new spill prevention, detection and response technologies. Collectively, individual companies and API spend millions of dollars each year in these endeavors.

There is no question in my mind that pipelines built today are better and safer than those built 10, 20 or more years ago. The materials used are better; the quality control is better, the construction techniques are better, the coatings and corrosion protection is better, the inspection technology is better and the leak detection technology is better. Even one of the opponents' witnesses, Charles Batten, conceded in his deposition that there have been improvements in

pipeline safety.[1] Indeed, the latest evaluation of Office of Pipeline Safety data shows that the industry's record of spills and reportable events has improved substantially over the last thirty years, with the number of spills falling 40% and the volume of oil spilled falling by 60%.

Q. In his testimony, John Mastandrea states that "OPL proposes to build a standard pipeline with technology that has existed for the past 30 years with little or no improvement." Do you agree with that statement?

A. No. The Cross Cascade Pipeline's proposed design and operation reflects the state-of-the-art in the pipeline industry, incorporating the latest proven technology to minimize safety and spill risks. The project also goes above and beyond industry standards and regulatory requirements in a number respects. Among other things:

- The pipe specifications discussed above exceed regulatory standards and industry practice.
- The coating system discussed above is more extensive than found on most liquid pipelines.
- Olympic's proposal to install block valves that are remotely operated, weld-end, above-ground and equipped with temperature and pressure measuring instrumentation exceeds regulatory requirements and industry practice.
- The pipeline will be buried with a minimum 4 feet of cover, although standard industry practice is to place pipe at a depth of only 3 feet of cover.

[1] Deposition of Charles Batten at 138:

Q. In this report entitled "Remote Control Spill Reduction Technology" by the Volpe Center, the following statement is found: "The federally regulated pipeline system has consistently improved is safety record over the last 25 years." Do you agree with that statement?

A. I think I've already stated to you that I feel like there have been improvements, but I wouldn't want to try to characterize it statistically because I don't believe the data system. . . .

Excerpts from Mr. Batten's deposition are provided as Exhibit LCB-1.

- Olympic will inspect 100% of welds radiographically during construction, even though federal regulations require only 10% of each welder's welds to be x-rayed each day.
- Olympic will conduct aerial overflights to visually inspect the pipeline on a weekly basis (weather permitting), even though federal regulations require only 26 overflights per year.
- Olympic will conduct an initial internal line inspection after construction with inspections at regular intervals thereafter, even though no internal inspections are required by federal regulation and such inspections exceed industry practice.
- Olympic will conduct regularly scheduled static tests of the pipeline, which are not required by federal law.
- Olympic will utilize a sophisticated leak detection system, which is not required by federal law.

Additional Mitigation

Q. Some witnesses have suggested incorporating a variety of additional design features or operational practices in the project to minimize the likelihood or volume of spills and to improve the ability to detect leaks or spills. Based on your expertise, what is your general reaction to these recommendations.

A. Some of the recommended design features or practices make sense, and in fact, Olympic has already incorporated these good ideas in the proposed project. Other recommended technologies simply have not been proven to be reliable. Pipeline companies have strong incentives to minimize spills and leaks, and as I mentioned before, the pipeline industry is constantly exploring new technologies that will improve pipeline safety and integrity. Many technologies that seem promising in theory, however, do not prove to be feasible or effective in practice. No one's interests would be served by requiring Olympic to incorporate unreliable and unproven technology in the Cross Cascade Pipeline Project.

Q. Let's discuss some of the specific recommendations made by other witnesses. Some witnesses have recommended using so-called "double-walled" pipe to prevent spills or leaks. Do you agree with that recommendation?

A. No. As I understand their recommendation for double-walled pipe, they essentially mean that the pipeline should be placed within another pipe. This pipe-within-a-pipe design would create several problems. First, it would prevent the effective corrosion control, including the use of cathodic protection systems to prevent corrosion of the pipes. This would be particularly problematic because moisture would likely accumulate between the two pipes and lead to the corrosion of both. The double-wall construction would also make it impossible to inspect the outer pipe with internal line inspection devices. In the event of a leak, the double-wall construction would also make it extremely difficult to pinpoint the leak's location.

Q. Are you aware of any pipeline of a size comparable to the Cross Cascade Pipeline that has utilized double-walled pipe?

A. No. Historically, double-walled or even encased pipe has not been used as a leak containment device. The only common experience with a double-walled sort of design has been in the context of encased crossings under roads or railroads where the casing was designed to help accommodate the stress from the road or railroad. In the past, most major roadway and railroad crossings were cased because it was felt that greater protection from stress would result, but after years of experience with deteriorating carrier pipes inside cased crossings, the pipeline industry determined that the cased piped created greater risk of corrosion-related failures. For this reason, the industry has generally moved away from cased road and rail crossings, except where loadings create unacceptable stresses.

Q. Charles Batten testified that ARCO Alaska used a double-wall pipe design in the Alpine exploration product. Would it make sense to use comparable technology on the Cross Cascade Pipeline?

A. No, I do not believe so. Although I am not particularly familiar with the Alpine project, it is my understanding that the Corps of Engineers required ARCO to use a cased pipe design (rather than a pressure contained double-wall pipe) for the crossing of the Colville River. I do not believe that design is preferable to a single-wall design in light of the corrosion-related problems discussed above. Indeed, Mr. Batten conceded in his deposition that he did not know whether the ARCO cased pipe had been successful.[2]

Q, Kenneth Johnson testified that Olympic should construct lined trenches in which to place the pipeline in "high-value groundwater resource areas." Do you agree?

A. No. Although some type of secondary containment devices might be utilized at terminals or around storage tanks, I am not aware of any cross-country pipeline that has been constructed within a lined trench. It is not clear how effective a lined trench would be at containing a pipeline release or how one could verify the integrity of the lining. Moreover, a lined trench might well cause more damage than good by undermining the cathodic protection and channeling or collecting water around the pipeline, which would result in corrosion.

Q. James Miller testified that "permanent diversionary berms that are properly graded to lead any spills to containment structures" should be constructed in certain sensitive areas. Is that a good idea?

A. No. I am not aware of any cross-country pipeline of this size that has been constructed to include these sort of berms and containment structures. Although pipelines do use "retards" on slopes to avoid ditch erosion, constructing berms and containment structures along a pipeline of this length

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[2] Deposition of Charles Batten at 126:

Q. Has this – do you know whether this pipeline is in operation yet?
A. No, I do not know.
Q. Do you know whether ARCO, in fact, built the crossing the way it's described here?
A. No, I do not. I can only tell you what was in the documents.
Q. So I take it you don't know whether this has – this approach has been successful for ARCO?
A. No. I can only tell you that ARCO reported that it would be taking this approach . . . .

would be impractical and would likely cause far more disruption to the environment than construction of the pipeline itself.

Q. Charles Batten testified that block valves should be placed every 10 miles along the pipeline route. Do you agree with that recommendation?

A. No. Placing block valves every 10 miles, or at any preset interval regardless of the hydraulic conditions of the pipeline, would not be appropriate. Block valve placement requires a case-by-case evaluation to select the most effective valve location. In the event of a pipeline rupture, block valves can cut off the flow of product, but a high point in the line serves as a natural hydraulic break that obviates the need for a block valve. A preset spacing criteria might call for a valve to be placed at a high point, where it would serve no purpose. As Mr. Batten conceded in his deposition, an analysis of topography is critical to determining proper block valve location.[3] At the same time, every additional block valve increases the risk of leakage by increasing exposure to mishap or other damage. In this case, the Application reflects a careful balancing of these benefits and risks in determining the block valve placement, taking into account the line configuration, hydraulic profile, accessibility and the sensitive areas sought to be protected. Olympic's valve spacing process goes beyond the approach evaluated in the Volpe National

[3] Deposition of Charles Batten at 111-12:

Q. At line 14, you say, "A detailed study of the topography in these stretches would probably review that there was a significant benefit to adding block valves in these stretches." Why does topography matter?

A. Because the – a rupture in a pipeline, once you get a system – once someone detects there is a rupture or leak. And once someone either sends someone out to manually close valves or – if this proposal goes through, as I understand, Olympic will have remote control valves, they close the remote valves, you are still going to drain, under hydrostatic head, the product uphill of the rupture. . . .

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Q. Have you conducted a detailed study of the topography of the Cross Cascade Pipeline will run across?

A. No, I have not.

Transportation Systems Center report to the USDOT. As a matter of fact, the Vole Study did not conclude that set valve placing was effective.

Q. Some witnesses testified that there should be additional mainline check valves along the pipeline route. Do you agree?

A. No. Although Olympic has designed the pipeline to include some mainline check valves located at pump stations, Olympic has generally opted to use remotely-operated block valves instead of check valves because they are more reliable. Given the numerous block valves located along the route, additional mainline check valves are not necessary.

Q. Some witnesses have recommended the use of hydrocarbon sensing cables laid alongside the pipeline to detect releases. Do you agree with that recommendation?

A. No. There is no proven technology for using hydrocarbon sensing cables along a pipeline of this length, and I am not aware of any similar pipeline that utilizes hydrocarbon sensing cables in this way. These cables may have some useful applications, but the technology has not advanced sufficiently to run them for long distances along a pipeline. In instances in which hydrocarbon sensing cables have been used, they have produced many false alarms and have required continual replacement, adjustment and maintenance, which necessitated excavation and the associated environmental impacts. Although the idea of a hydrocarbon sensing cable is attractive, the current technology is just not reliable enough, and using hydrocarbon sensing cables may produce a false sense of security in light of the reliability problems associated with this technology.

Q. Charles Batten (CCA) testified that the Williams Pipeline Company is using hydrocarbon sensing cables where its pipeline crosses a large aquifer. Are you familiar with this pipeline?

A. Generally yes, but again, this technology is still not proven for significant lengths of line. What Mr. Batten fails to point out is that Williams Pipeline spent years trying to get this methodology

to work. Mr. Batten also conceded in his deposition that he was not aware of any other pipeline using this hydrocarbon sensing technology.[4] It is my opinion that there are more practicable and more effective methods of spill detection.

Q. William Roberds (Cross Valley) testified that Olympic should employ some sort of vapor sensor system to detect leaks. Do you agree with that recommendation?

A. No. Mr. Roberds has not provided any detail regarding the type of vapor sensor system he envisions, and I am not familiar with any proven technology that could be used along a pipeline of this length. Olympic is planning to use sensors at selective locations such as pump stations.

Q. Some witnesses have recommended that Olympic use acoustic sensors or an acoustic leak detection system. Do you agree with that recommendation?

A. No. Although the witnesses have not provided any detail regarding the acoustic systems that they have recommended, I understand that there are two general types of acoustic leak detection systems. The first type involves the use of directional microphones to pick up the "whistling" sound of a small leak. These acoustic devices could be used to determine the precise location of a leak that is already known to exist. Presumably Olympic would consider using acoustic devices if needed and appropriate to locate a known leak. The second type of acoustic leak detection is a system that supposedly detects the sound wave associated with the first sound of a leak. Although this technology may have some promise, it is still in the development stage. I am not aware of any demonstrated performance of this type of system on a pipeline of this length.

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[4] Deposition of Charles Batten at 85:

Q. Are you aware of anyone other than Williams Pipeline that uses this technology on a petroleum product pipeline?

A. I have no personal direct knowledge of going out and seeing a pipeline -- a hydrocarbon sensing system on another system.

Q. Do you know of any other pipeline system that uses this technology?

A. One does not come to mind at this point.

Q. Some witnesses have recommended using "clamp-on" meters to detect leaks. Do you agree with this recommendation?

A. No, primarily because these meters are not nearly as accurate as the turbine meter system that Olympic already proposes to use on the Cross Cascade Pipeline. Although some applications may favor these installations, the PLDS that Olympic plans to use exceeds the "clamp on" capability.

Q. Several witnesses have testified that Olympic should conduct periodic hydrostatic tests of the pipeline. Do you agree with this recommendation?

A. No. Olympic does intend to conduct a hydrostatic test before putting the pipeline into operation. Once the pipeline is in operation, hydrostatic tests are not necessarily the best way of detecting leaks. By definition, hydrostatic testing requires product to be displaced from the line, and the line to be filled with water and pressurized to a predetermined level. Following completion of the test, the pipeline would then be faced with the environmental issues associated with contaminated hydrostatic test water. Although a hydrostatic test might verify line integrity at a point in time, the use of smart pigs for internal line inspection would more readily insure integrity of the pipeline, particularly since these inspections detect anomalies and thinning pipe walls that may lead to a hole or failure at some future point. Moreover, Olympic plans to conduct regular static tests of the line, which serve the same purpose as hydrostatic tests, without presenting the problems associated with contaminated hydrostatic testing water.

Q. James Miller (CFE) testified that "[h]ydrostatic testing is the only nondestructive testing method capable of detecting small leaks." Do you agree with this recommendation?

A. No. As explained above, internal line inspection will detect small leaks better, and it will also point out areas of deterioration or other anomalies before a potential leak develops.

Q. James Miller (CFE) testified that aerial surveillance should be videotaped and the tapes carefully reviewed afterwards. Do you agree with this recommendation?

A. No. The industry has had considerable success with aerial surveillance over a long period of time. A trained patrol pilot notes areas of concern or questionable activity, which are then followed up with ground investigation. A videotape would have a more limited view than a pilot, and would be of questionable value.

Q. John Mastandrea (CCA) testified that aerial surveillance should use Forward-Looking Infrared (FLIR) pollution sensing equipment. Do you agree with this recommendation?

A. No. It is not clear at this time that FLIR would be any more effective than current aerial surveillance methods. It is my understanding also that the current FLIR technology does not work reliably where vegetation is present.

Q. Elin Storey (WDOE) testified that aerial surveillance should be conducted by helicopter instead of single-wing aircraft. Do you agree with this recommendation?

A. No. Having ridden in both fixed-wing aircraft and helicopters for line surveillance, I believe surveillance is generally more effective using fixed-wing aircraft. Although helicopters are used in special cases, such as offshore surveillance, their use has not proven to be cost-effective. Fixed-wing aircraft is the method preferred by pipeline companies.

Q. Some witnesses recommended inspections by persons walking the line in addition to aerial surveillance. Do you agree with this recommendation?

A. Not as a general matter. Although line walking was common decades ago, aerial surveillance is preferred today. Aerial surveillance typically gives broader coverage than having someone walk the line. Among other things, aerial surveillance makes it possible to spot potentially damaging third-party activities before they begin to encroach on the pipeline right-of-way, and these sorts of activities are often not visible at ground level.

Q. James Miller (CFE) recommended that Olympic conduct inspections by line-walkers using hydrocarbon gas monitoring probes. Do you agree with this recommendation?

A. Not as a general matter. Aerial surveillance, static tests, the SCADA system and the PLDS generally provide better means of detecting leaks than using line walkers with hydrocarbon probes. I am not familiar with any pipeline of this length that relies primarily on line walkers as a leak detection system. If a leak were suspected, however, it might be appropriate to have line walkers use hydrocarbon monitoring probes to confirm and locate the suspected leak.

Q. Several witnesses testified that Olympic should conduct internal line inspections using "smart pigs." Do you agree?

A. Yes, I do agree that regular internal line inspections with magnetic flux leakage (MFL) and geometry inspection pigs are excellent ways to assess a pipeline's current condition and to evaluate areas that may develop into problems later. It is my understanding that Olympic plans to conduct an initial internal line inspection to provide baseline information, and that Olympic will conduct subsequent internal line inspections periodically.

Q. Some witnesses have also specified that Olympic should utilize the "high-resolution" magnetic flux leakage (MFL) pig developed by British Gas when conducting internal line inspections. Do you agree?

A. No. Olympic already intends to conduct internal line inspections with a high resolution magnetic flux leakage tool. British Gas is only one of a number of competent vendors providing internal line inspection services. There is no reason that Olympic should be required to use the British Gas equipment as opposed to similar technology provided by other vendors.

Q. James Miller (CFE) testified that internal line inspections of the pipeline, with magnetic flux pigs, should be conducted annually; Lois Epstein (CCA) testified that internal inspections should be conducted every other year; and John Mastandrea (CCA) testified that internal inspections should be conducted once every three years. How frequently do you believe Olympic should conduct internal line inspections?

A. Although most pipeline companies have not done so, Olympic intends to conduct an initial internal line inspection following construction. This initial inspection will provide important baseline information. Olympic also prudently plans to conduct a subsequent internal line inspection within five years after construction. The schedule for additional inspections to be conducted thereafter should depend upon Olympic's assessment of the pipeline's condition as indicated by inspection results and Olympic's experience with pipeline conditions. Circumstances may or may not justify more frequent inspections in the future. The inspection frequency, however, should be based on an analysis of pipeline conditions, not on some arbitrary time frame.

Risk of Spills

Q. Several witnesses have testified about the risks associated with operating a refined petroleum product pipeline. What is your reaction to that testimony?

A. In general, I believe that testimony exaggerates the risks involved in pipeline transport. Pipelines are an efficient and safe means of transporting refined petroleum products. In the United States there are more than 200,000 miles of liquid pipelines, and these lines transport almost half of all of the crude oil and petroleum products supplies for the nation.

Q. The Counsel for the Environment's witness James Miller testified that the proposed pipeline "may actually present a greater risk to the environment than the current system" of transporting refined petroleum products from Western to Eastern Washington." Do you agree with that assessment?

A. No. I have not performed any evaluation of statistic probability, but based on my years of experience in the petroleum industry, having dealt with pipeline, barge and truck transportation, I believe that the proposed project will reduce spill-related environmental risks and public hazards.

Q. Why?

A. A few very common sense reasons.

First, the proposed project would cut the distance that product travels almost in half. As I understand it, product shipped from Western Washington refineries to Eastern Washington is currently shipped south by pipeline, ocean tanker, or ocean barge to the Portland area, and then shipped up river to the Tri-Cities area, where it is distributed by truck. Instead of traveling more than 400 miles under the current system, the proposed pipeline travels a fairly straight 230-mile line from the Woodinville area to Pasco. By reducing the distance traveled, the project substantially reduces the risk of leaks and spills, particularly from an exposure standpoint. In other words, even if you agreed with the opponents' witness Charles Batten, that barge and pipeline transport were equally safe,[5] the status quo would produce twice the risk because it requires twice the transport.

Second, the proposed pipeline reduces the number of product transfers, which again reduces the risk of accidents and inadvertent releases. Transfers from terminals to barges or ships take place on water and require manual connection to be secured in all types of weather. Spills frequently occur at transfer points.

Third, the proposed pipeline gets petroleum products off the water. When petroleum products are transported by tankers and barges, spilled product goes directly into the water. In contrast, most of the pipeline route is on land, and any spills or leaks are, therefore, likely to occur on land, where they are easier to contain and clean up, causing less environmental damage.

[5] Deposition of Charles Batten at 117-18:

Q. Do you have an opinion about the relative risk associated with the day-to-day operation of a refined petroleum pipeline versus other means of transporting refined petroleum product.
A. Well, I though we addressed that earlier today, did we not?
Q. Perhaps.
A. I think, earlier, if you will review the statements, was that both marine and pipeline transportation modes have an ability to be rather safe modes. Some people have said that pipeline is safer than marine; other s that marine is safer than pipelines. I don't think I have ever seen any data which I considered adequate to say which one was – is safer than the other.

Finally, the proposed pipeline minimizes human safety risks. Transporting petroleum products by truck is far more dangerous than doing so by pipeline from a human safety standpoint. The proposed pipeline will remove trucks from the roads and reduce traffic across the mountain passes.

DATED: March ____, 1999.

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Larry C. Bennington